



IMPACT OF INTERVENTIONS ON NEEDLE STICK INJURIES AMONG HEALTH CARE WORKERS IN A TERTIARY CARE HOSPITAL

Microbiology

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ABSTRACT

Background:

Percutaneous injury with an infected sharp device can lead to exposure of the health care worker (HCW) to various blood borne pathogens.

Aims and Objectives:

To review the pattern of needlestick injuries (NSIs) and to study the impact of interventions on the NSIs injuries.

Material & Method:

All NSIs were documented and monitored as per the occupational exposure to blood borne pathogen reporting policy of the hospital. Impact of various interventions was noted.

Result:

During a 5 year period, 276 health care workers reported NSIs. Due to increased awareness the reporting of NSIs increased. There was a decrease in the NSIs which occurred while handling Bio Medical Waste (BMW) after the introduction of on-site small puncture proof sharp containers and after the introduction of retractable BSL device. Reporting of NSI within 2 hours of exposure was improved to 95% resulting in providing timely post exposure prophylaxis. Hepatitis B immunization status of exposed HCWs improved after hospital wide Hepatitis B immunization programme.

KEYWORDS

Needlestick injury, occupational exposure, blood borne pathogen, Health care workers

INTRODUCTION

Percutaneous injury with an infected sharp device can lead to exposure of the HCW to various blood borne pathogen like hepatitis B virus (HBV), hepatitis C virus (HCV) and human immunodeficiency virus (HIV). The first report of HIV transmitted to a Health care worker (HCW) as a result of a needlestick injury (NSI) was published in 1984(1). It has been estimated by CDC that every year more than three million HCWs are exposed to blood and body fluids via sharp and mucocutaneous injuries in United States alone with an annual estimated 6 million NSIs (2). Due to NSIs the risk of infection ranges from as low as 0.2-0.5 % for HIV, 3-10% for HCV and 40 % for HBV (3). The absence of appropriate post exposure prophylaxis (PEP) in such exposures is associated with increased risk of infection in these subjects (4). The emotional impact of a needlestick injury can result in considerable psychological trauma to the exposed HCW (5). Studies show that many of the occupational exposures that occur in hospital go unreported, and thus the number of infected individuals may be much higher than the figures actually reported (6,7,8). Unreported NSIs are a serious problem and stop injured HCWs from receiving post exposure prophylaxis against HIV (4). In our hospital surveillance of NSI is an ongoing process. We have defined policy for the management of occupational exposure to blood borne pathogen. Here we present the surveillance data of NSI along with the effect of various timely interventions during this period.

MATERIAL & METHODS

Surveillance of NSI is an ongoing process in our hospital which is a tertiary care teaching hospital. Here we present the surveillance data of 5 years (2013-2017). All occupational exposures are managed as per the hospital policy. All HCWs are instructed to wash the site under the running water immediately after the exposure. Infection control nurse was informed and reporting was done to ICU physician. The HCWs gave details of injury to the ICU physician. All the details including the demographic details, location, time of exposure, reporting time, type of injury, procedure leading to injury and source details were entered in post exposure prophylaxis form. HCW's Hepatitis B immunisation status was noted. The source status for HIV, HBV and HCV was noted. Depending on the source status the exposed was tested for the

above tests. If the source was HIV positive then PEP for HIV as per Infectious disease consultation was started. Post exposure prophylaxis was given for 28 days. If exposure was for hepatitis B positive source then the HCW's Anti HBsAg antibody titre was tested. If the titre was above 10mIU/ml no further treatment was given. If the titre was below 10mIU/ml then Hepatitis B immunoglobulin was given as per the recommendation. For all these exposures ID consultation was done. Health care workers were followed for 6 weeks, 3 months and 6 months for seroconversion. Incidence reporting of all NSIs was done. In depth root cause analysis of all NSIs was carried out. Corrective and preventive action was taken accordingly. Counselling of the exposed HCW was given priority.

In our hospital emphasis is given on infection control training of all HCWs including doctors, residents, interns, nurses and technicians. This is an ongoing process. Training is conducted in the form of induction training, regular lectures, practical training in the form of work stations and bed side training. Emphasis is given on universal safety precautions. The HCWs are trained regarding importance of biomedical waste segregation, sharp disposal, safe injection and infusion practices and avoiding recapping. Infection control week is celebrated every year to increase the awareness. During this week infection control quiz, poster competition and various lectures on infection control are organized. Posters of biomedical waste segregation, PEP protocols and safe injection practices are displayed all over.

During this 5 year period various interventions were tried to decrease the NSI due to a particular device. It was noted that there was a sharp rise in NSI during handling BMW in 2013 and 2014. On site puncture proof sharp containers were introduced in 2015 to prevent sharp injuries during handling of BMW. The HCWs were instructed to carry this container at the site of the procedure. It was also observed that many nurses got NSI during BSL testing till 2016. So self-retracting lancet for BSL monitoring was introduced in 2017. Many HCWs reported NSI during burning the needle, so needle burning protocol was stopped to reduce NSI during this procedure.

Hospital wide Hepatitis B vaccination programme was intensified to improve the immune status of the HCWs. Hepatitis B vaccination was made available free of cost. Vaccination card was provided to all the HCWs during vaccination. Reminders were sent before the due date of vaccination.

RESULT:

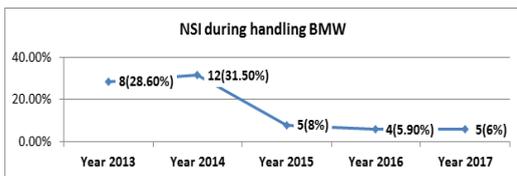
During the five year period of 2013-2017 total 276 sharp injuries were reported. There was a gradual rise in the number NSI reported. 28 (2013), 38(2014), 60(2015), 68(2016) and 82(2017). There was a gradual rise in the percentage of HCWs reporting sharp injuries within 2 hours. 46% (2013), 66% (2014), 95% (2015), 95% (2016) and 95% (2017) of exposed HCWs reported within 2 hours of the incident.

Table 1: Procedures leading to sharp injuries

PROCEDURES	TOTAL
IV access	37(13.4%)
Needle Recapping	35(12.7%)
Handling BMW	34(12.31%)
Discarding needle	31(11.2%)
Injection administration	29 (10.5%)
BSL	25(9%)
Suturing	25(9%)
Surgical blade during surgery	19 (6.8%)
Withdrawing blood	16(5.8%)
Burning needle	14(5%)
Others	11(4%)
Total	276 (100%)

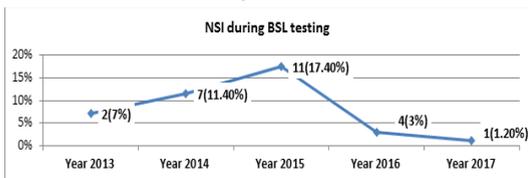
Maximum number of sharp injuries 37 (13.34%) occurred during IV access followed by recapping 35(12.7%), handling biomedical waste 34 (12.31%), discarding needle 31(11.2%), Injection administration 29 (10.50%), suturing 25(9%) and BSLtesting 25(9%) (table:1)

Figure 1: Impact of on site puncture proof container on NSI



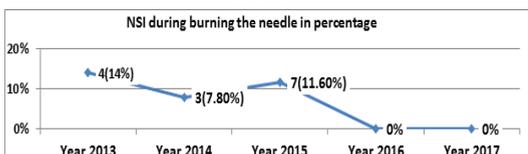
After the introduction of puncture proof containers in 2015 there was a decrease in sharp injuries from 12(31.50%) in 2014 to 5(8%) in 2015 (fig: 1)

Figure2: Impact of retractable BSL testing device on sharp injuries



After the introduction of retractable BSL testing device in 2016 there was a drop in NSI during BSL testing from 11(17.40%) in 2015 to 4(3%) in 2016.(Fig:2)

Figure 3: Impact of discontinuation of needle burning practices on NSI



After needle burning practices were stopped in 2016. The NSI during burning the needle were reduced to zero in 2016 and 2017.(Fig:3)

Category of HCW: Maximum needlestick injuries were reported by

Staff nurse 86(31%) followed by MPW 66(21%), student nurse 54(20%) doctors 36(13%), residents 26(9.4%) and technicians 8 (2.9%).

Hepatitis B vaccination status of exposed HCWs: After hospital wide Hepatitis B immunization the compliance of exposed HCWs to Hepatitis B immunization improved gradually. 39.3%(2013), 74%(2014), 91%(2015), 94 % (2016) and 95% in 2017 were completely vaccinated

Table 2 : Source status

Known seropositive (HIV, HCV and HBsAg)	Known sero negative for HIV, HCV and HBsAg	Unknown	Total
46(16.6%)	179 (65%)	51(18.4%)	276(100%)

The source was sero positive in 46 (16.6%), sero negative in 179(65%) and in 51(18.4%) source was not known. Out of 46 seropositive sources 24(52%) were HIV positive, 21(46%) HBsAg positive and 1(2%) HCV positive source.

Antibody to Hepatitis B antigen: The titre of HCWs exposed to Hepatitis B positive source showed following results: In 2013 none of the exposed HCWs showed protective titre while in 2014, 2016 and 2017 all the exposed HCWs showed protective titre (above 10mIU/ml) (Table:3)

Table :3 Antibody titre to HBsAg among Hepatitis B exposed HCW

Year	No of HCWs exposed to Hepatitis B positive source	Protective titre (above 10mIU/ml) No of HCW(%)
2013	3	0 (0%)
2014	3	3 (100%)
2015	08	7 (87.5%)
2016	04	04(100%)
2017	03	03(100%)

DISCUSSION

In our study total 276 NSIs were reported during 2013 to 2017. This is much lower than the NSI reported by A mehta et al in 2010 (9). They reported 342 NSI in 4 years in 351 bedded hospital. In another study by ST Jayanth et al 296 HCWs sustained NSI during 1 year period (10). Our figures are much lower than this. This may be due to under reporting of NSI in our hospital during initial period of study. There was gradual rise in the number of HCWs reporting NSI during 5 years. This was due to increased awareness created during continuous training and education of all HCWs

Treatment of NSI should be started as early as possible. Due to increased awareness there was prompt reporting in 2016 and 2017. So we could initiate PEP at the earliest and this benefited the health care workers.

Maximum number of sharp injuries 37 (13.34%) occurred during IV access, recapping 35(12.7%), handling biomedical waste 34 (12.31%), discarding needle 31(11.2%), suturing 32 (11.20%), injection administration 29 (10.50%), suturing 25(9%), BSLtesting 25(9%), surgical blade during surgery 19(6.8%), withdrawing blood 16(5.8%), burning needle 14(5%).

There was a decrease in the number of NSI caused during handling BMW due to the introduction of on site puncture proof containers (from 31.50% in 2014 to 8% in 2015) There was also a decrease in the number of NSIs caused during BSL testing from 17.40% in 2015 to 3% in 2016 due to the introduction of self retractable BSL testing lancet.

There was also decrease in the number of NSI due to discontinuation of needle burning protocol.

In our surveillance majority of the HCWs who got NSI were staff nurses (31%). Since they are more closely involved in patient care and there was lot of new recruitment of nursing staff during this period. This indicates the requirement of more intense training of newly recruited staff. This was followed by MPWs (24%). Most of the NSI occurred to MPWs were while handling BMW. That is the reason we introduced

onsite puncture proof containers for the disposal of sharp.

The Hepatitis B vaccination status of the HCWs improved from 39.3% in 2013 to 95% in 2017. This was possible due to hospital wide Hepatitis B immunisation programme. Vaccination was given free of cost to all HCWs. Vaccination card was provided and reminders were sent.

We also analysed the antibody to HBsAg titre of HCWs exposed to Hepatitis B positive source. Due to good compliance to Hepatitis B vaccination percentage of HCWs showing protective titre improved from 0% in 2013 to 100% in 2014, 87.5% in 2015, 100% in 2016 and 2017.

The hospital-wide Hepatitis B immunisation programme helped to raise the immune status of the exposed HCWs so as to reduce the costly prophylactic usage of Hepatitis B immunoglobulin.

World wide, there are 296 cases of HIV seroconversion after occupational exposure (11). Two possible cases of occupationally acquired HIV infection have been reported from Chandigarh (12). In our hospital six month followup showed zero seroconversion for HIV, HBsAg and HCV exposure, which is similar to other studies in INDIA (10, 13, 14, 15).

Conclusion: With continuous surveillance occupational exposures to blood borne pathogens can be reduced. Protocol for reporting occupational exposures, efficient and prompt PEP, proper followup of exposed HCWs, hospital wide Hepatitis B vaccination, continuous education and training of all HCWs are crucial for the safety of HCWs. Timely interventions like introduction of onsite puncture proof containers and self retractable BSL testing lancet can reduce NSI occurring in any hospital. Incident reporting followed by root cause analysis with effective corrective and preventive action will assist in controlling NSIs.

REFERENCES

1. Needle stick transmission of HTLV-3 from a patient infected in Africa. *Lancet* 1984;2:1376-7
2. Lee J M, Botteman MF, Xanthakos N, Nicklasson L. Needle stick injuries in the United States. *Epidemiologic, economic and quality of life issues AAOHN J* 2005;53:117-33
3. Cheng HC, Su CY, Yes Am, Huang CF. Factors affecting occupational exposure to needle stick and sharps injuries among dentists in Taiwan: A nation wide survey. *PLoS One* 2012;7:e34911
4. Wilburn SQ. Needlestick and sharp injury prevention. *Online j issues Nurse*;2004;9:5
5. Bowden FJ, Pallet B, Birrel F, Dar EM. Occupational exposure to the immunodeficiency virus and other blood borne pathogens: A six year prospective study. *Med J Aust* 1993;158:810-2
6. Vargese GM, Abraham OC, Mathai D. Post exposure prophylaxis for blood borne viral infections in health care workers. *Postgrad med J* 2003;79:324-8
7. NIOSH ALERT. Prevention of needle stick injuries in health care settings. DHHS(NIOSH) Publication No 2000-108. Nov 1999.
8. Sharp injury control program report. Department of health services. California. January 2002
9. Mehta A, Rodrigues A, Singhal T, Lopes N, D'Souza N, Sathek et al. Interventions to reduce needle stick injuries at a tertiary care centre. *IJMM* 2010;28(1):17-20
10. Jayanth ST, Kirupakaran H, Brahmadathan KN, Gnanaraj L, Kang G. Needle stick injuries in a tertiary care hospital. *IJMM*, (2009) 27(1):44-7
11. Perry J, Palkar G, Jagger J. EPINET report: 2013 percutaneous injury rates. *Adv Exposure Prev* 2005;7:2-45
12. Wachu A, Singh S, Bamberg P, Varma S. Possibly occupationally acquired HIV infection in two Indian health care workers. *Med Gen med* 2006;24:8: 56.
13. Mehta A, Rodrigues C, Ghag S, Bavi P, Shenai S, Dastur F. Needle stick injuries in a tertiary care centre in Mumbai, India. *J Hosp Infect* 2005;60:368-73
14. Richard VS, Kenneth J, Ramaprabha P, Kirupakaran H, Chandy GM. Impact of introduction of sharp container and education programmes on the pattern of needle stick injuries in a tertiary care centre in India. *J Hosp Infect* 2001;47:163-5
15. Rele M, Mathur M, Turbulkar D. Risk of needle stick injuries in health care workers: A report. *IJMM* 2002;20:206-7